

WHAT IS CLAIMED IS:

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1. A data coding method comprising:

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accepting digital data for coding;

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pseudo-chaotically coding the digital data by allocating the digital

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data to a state sequence assigned according to a chaotic map;

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converting the pseudo-chaotically coded data to analog form and

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modulating the pseudo-chaotically coded data into synchronization frames.

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2. The data coding method according to claim 1, wherein said

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step of pseudo-chaotically coding comprises:

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shifting the digital data in a shift register with a most recent bit of

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information in a given clock cycle of shift register operation being assigned as a

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least significant bit in the shift register and the oldest bit being discarded.

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3. The data coding method according to claim 1, wherein said

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step of pseudo-chaotically coding comprises assigning a state sequence according

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to symbolic dynamics defined on the chaotic map, wherein a Markov partition

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identifies symbolic states and transitions associated to the digital data.

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4. The data coding method according to claim 1, wherein said

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step of modulating comprises assigning a position of a pulse train within a

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synchronization frame for each transmitted bit(s), the synchronization frame being

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partitioned, according to symbolic dynamics defined on the chaotic map.

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5. The data coding method according to claim 1, further

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comprising a step of randomizing the digital data prior to said step of pseudo-

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chaotically coding.

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6. The data coding method according to claim 5, wherein said

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step of randomizing comprises a step of compressing the digital data according to

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a data compression algorithm.

1 7. The data coding method according to claim 5, wherein said
2 step of randomizing comprises scrambling the data according to a scrambling
3 algorithm.

1 8. The data coding method according to claim 1, wherein said
2 step of modulating allows a guard interval between synchronization frames.

1 9. The data coding method according to claim 1, wherein said
2 step of pseudo-chaotically coding comprises steps of:

3 shifting the digital data into the shift register, wherein the shift
4 register operation approximates the dynamics of a Bernoulli shift map of the form
5 $X_{K+1} = 2X_K \bmod (1)$, and

6 converting the shifted digital data according to a conversion of the
7 form $X_{K+1} = 1 - 2 |X_K - 0.5|$.

1 10. A data coding and decoding method, the method comprising
2 steps of:

3 accepting digital data for coding;
4 pseudo-chaotically coding the digital data by applying a chaotic map
5 having N states;

6 converting the pseudo-chaotically coded data to analog form;
7 modulating the pseudo-chaotically coded data to produce a
8 modulated signal;

9 transmitting the modulated signal over a channel;

10 receiving, at a receiver, a signal from the channel;

11 decoding the pseudo-chaotically coded data from the signal, the

12 decoding comprising Viterbi detection matched to the chaotic map with N or

13 fewer than N states.

1 11. The method according to claim 10,
2 wherein said step of pseudo-chaotically coding comprises assigning
3 a state sequence according to symbolic dynamics defined on the chaotic map,

4 wherein a Markov partition identifies the symbolic states and the transitions
5 associated to the input bits.

1 12. A data coding system comprising:
2 a pseudo-chaotic data encoder for pseudo-chaotically encoding
3 digital data, the pseudo-chaotic data encoder comprising a shift register for
4 shifting the digital data and a digital signal processor for translating shifted digital
5 data according to a selected chaotic map;
6 a digital to analog converter for converting the pseudo-chaotically
7 shifted and translated digital data;
8 a modulator for modulating output of the digital to analog converter
9 for transmission on a communication channel; and
10 a receiver for demodulating and decoding the pseudo-chaotically
11 coded data from the signal, the decoding comprising Viterbi detection matched to
12 the chaotic map with N or fewer than N states.

1 13. The data coding system according to claim 12, further
2 comprising an output mapper that reconstructs the transmitted message given the
3 estimated sequence of states provided by the detector.

1 14. The data coding method according to claim 12, further
2 comprising a step of randomizing the digital data prior to said step of pseudo-
3 chaotically encoding.

1 15. The data coding method according to claim 14, wherein said
2 step of randomizing comprises a step of compressing the digital data according to
3 a data compression algorithm.

1 16. The data coding method according to claim 14, wherein said
2 step of randomizing comprises scrambling the data according to a scrambling
3 algorithm.

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